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[Claim(s)]
[Claim 1] [with the disk which has the truck formed by the spiral shape or concentric circular information pit sequence] In the part in the radius field of the specification of said disk The optical disk with an unjust copy prevention function characterized by having the displacement pit sequence which made the track radial direction displace said information pit sequence from on the center line of said information pit sequence over the truck length which produces a signal change detectable in a tracking error signal band.
[Claim 2] The optical disk with an unjust copy prevention function according to claim 1 characterized by having said two or more displacement pit sequences arranged with the predetermined time interval, and the combination of the displacement direction of each displacement pit sequence having the discernment pit section which consisted of groups of the displacement pit sequence which have pattern information.
[Claim 3] The optical disk with an unjust copy prevention function according to claim 1 or 2 characterized by having the field where the position information in which a displacement pit sequence or the discernment pit section exists was recorded.
[Claim 4] The optical disk with an unjust copy prevention function according to claim 2 characterized by having the field where the combination information on the displacement direction of each displacement pit sequence of discernment pit circles was recorded.
[Claim 5] [frequency higher than near the control gain intersection of tracking control] in the radius field of the specification of said disk in the disk which has the truck formed by the spiral shape or concentric circular information pit sequence And the optical disk with an unjust copy prevention function characterized by forming the rocking truck made to rock radially with the amplitude which does not affect reading of an information signal.
[Claim 6] The optical disk with an unjust copy prevention function according to claim 5 characterized by having the field where the position information in which a rocking truck exists was recorded.
[Claim 7] The optical disk with an unjust copy prevention function according to claim 5 characterized by having the field where the rocking frequency information on a rocking truck was recorded.
[Claim 8] The optical head which irradiates a light beam on an optical disk with an unjust copy prevention function Claims 1, 2, 3 and 4, 5 and 6, or given in seven, receives the reflected light, converts into an electrical signal, and is outputted as a regenerative signal, The tracking error signal detecting element which outputs the amount of position shifts of the light beam irradiated on said optical disk, and the center line of the information pit sequence on said optical disk as a tracking error signal, The optical disk unit characterized by having the displacement pit sequence detecting element which detects existence of said displacement pit sequence or said rocking truck from the level variation of said tracking error signal, and the disk judging section which judges whether it is a copy disk from the output of said displacement pit sequence detecting element.
[Claim 9] The optical disk unit according to claim 8 which has the displacement pattern coincidence detecting element which detects whether it consists of patterns of the

displacement pit sequence by which the discernment pit section was defined.
[Claim 10] The optical disk unit according to claim 8 characterized by having the rocking truck detecting element which detects whether the change frequency of tracking error signal level is the same frequency as the rocking frequency of said rocking truck.
[Claim 11] The arrangement position information detecting element which detects the position information in which a displacement pit sequence or said rocking truck exists, The optical disk unit according to claim 8, 9, or 10 characterized by having the disk judgment section which judges whether a displacement pit sequence or a rocking truck exists in the position which said arrangement position information shows.
[Claim 12] The displacement pattern information detecting element which reads and memorizes the displacement pattern information of the discernment pit section, The optical disk unit according to claim 9 characterized by having the displacement pattern coincidence detecting element which detects whether the appearance pattern of the displacement pit sequence from a disk is in agreement with the contents of said displacement pattern information detecting element.
[Claim 13] The optical disk unit according to claim 10 characterized by having the rocking frequency information detecting element which reads and memorizes the rocking frequency information on a rocking truck, and the rocking truck detecting element which detects whether the frequency component provided in said rocking frequency information exists in a tracking error signal.

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the optical disk unit which can distinguish whether they are the optical disk which has form peculiar to a disk in an information pit sequence, and the disk unjustly copied using information peculiar to the optical disk in the optical disk in which record reproduction is possible.
[0002]
[Description of the Prior Art] Optical disks including a compact disk are used as a means of communication of information in various fields, such as application software for personal computers in recent years, and a database, music.
[0003] Since especially a read-only optical disc imprints an information pit from the master stamper of one sheet to a plastic sheet by injection molding and can manufacture a disk, there is the feature which can produce the optical disk of the same contents in large quantities and inexpensive in a short time.
[0004] Using a figure, are and the tracking control method for reading information in an optical disk is explained. Drawing 25 is the block diagram of the conventional tracking control.
[0005] 200 is a disk and it is the disk motor which 201 rotates a truck, 202 rotates an optical spot, and 210 makes rotate a disk 200. 211 is the optical head which plays the signal on a disk 200 optically, and consists of the semiconductor laser of 212, the collimate lens of 213, the objective lens of 214, a half mirror of 215, a light sensing portion of 216, and an actuator of 217. 220 is the tracking error signal detecting element which detects the tracking error signal which shows the amount of position shifts of the radial direction of the optical spot 202 and a truck 201, and consists of a differential

circuit of 221, and a low pass filter of 222. The phase compensation section which generates the driving signal which drives an optical head from a tracking error signal 223, and 224 are head actuators which drive the actuator 217 in the optical head 211 based on a driving signal. They are the binary-ized circuit section in which, and 226 binary-izes a regenerative signal, and the signal-processing section which 227 restores to a regenerative signal and is changed into information data. [225] [the adder circuit of the signal from a light sensing portion 216]

[0006] First, although position control of the focus direction (focusing direction) of an optical spot is performed, a general target is premised on focus control being realized in this invention.

[0007] Below, operation in which tracking control is performed is explained. The laser beam irradiated from the semiconductor laser 212 is made into a parallel beam with a collimate lens 213, and it converges it on a disk 200 through the objective lens 214. The laser beam reflected by the disk 200 is detected considering the luminous energy distribution which returns to light sensing portions 216a and 216b through a half mirror 215, and is decided by the relative position of the optical spot 202 on a disk, and a truck 201 as an electrical signal. When the light sensing portions 216a and 216b of 2 division are used, the differential circuit 221 detects the difference of 216a and 216b of a light sensing portion, and a tracking error signal is detected by taking out low-pass [of a differential signal] by a low pass filter 222. In order to make the optical spot 202 follow a truck 201 A driving signal is generated in the phase compensation section 223 so that a tracking error signal may be set to 0 (the luminous energy distribution of light sensing portions 116a and 116b is equal), according to the driving signal, an actuator 217 is moved by the head actuator 224, and the position of the objective lens 214 is controlled.

[0008] On the other hand, if the optical spot 202 follows a truck 201, by the pit section of a truck, the amount of reflected lights decreases because light interferes, the output of a light sensing portion declines, and since the amount of reflected lights increases, in a portion without a pit, the output of a light sensing portion will become high. The total quantity of light of the light sensing portion output corresponding to this pit is calculated in the adder circuit 225, this regenerative signal is read with a binary signal in the binary-ized circuit section 226, and a clock is generated. It can use now as information by going via the signal-processing section 227 which performs a recovery and an error correction to this binary signal.

[0009] Although the information read from the optical disk is transmitted to a personal computer etc. and it is used within a personal computer, a part or all of information can also carry out record preservation at other archive media if needed. Generally, since it is protected by law, you cannot copy copyrights, such as application software for personal computers, without a right holder's consent. However, the copy prevention method that the information distributed in recordable Media records copy management information on Media for a certain reason, and the case copied unjustly is also managed may be taken.

[0010]

[Problem to be solved by the invention] However, in a read-only optical disc, since only playback of the information currently recorded can be performed, copy management information is not memorizable on the disk itself. Therefore, since the contents of the read-only optical disc are unauthorized, are copied to Media in which other inexpensive records are possible and are used, a technical problem occurs in respect of protection of

copyrights.
[0011] In view of the above-mentioned technical problem, this invention is adding identification information as form of a truck, and aims at preventing reuse of the information on a copy disk on the original disk regularly distributed under management of a right holder.
[0012]
[Means for solving problem] In order to solve the above-mentioned problem, the unjust copy prevention optical disk of this invention is characterized by preparing the displacement pit sequence which made the radial direction displace some trucks which consisted of information pit sequences from a track center line in some radius fields of an optical disk.
[0013] Moreover, it is characterized by having recorded the position information in which said displacement pit sequence exists in the disk which has said displacement pit sequence, and the displacement pattern information of said displacement pit sequence on said information pit sequence.
[0014] Moreover, while having the rocking track region which was made to rock the truck which consisted of information pit sequences with predetermined frequency and predetermined amplitude, and formed it, it is characterized by having recorded the position information or the information on rocking frequency that said rocking truck exists on said information pit sequence.
[0015] [furthermore, the optical disk unit with an unjust copy prevention function of this invention] The optical disk which has said displacement pit sequence, and the displacement pit sequence detecting element which detects existence of said displacement pit sequence from the level variation of a tracking error signal, With the arrangement position information detecting element and the displacement pit column information Management Department which read and memorize the arrangement position information and displacement pattern information of said displacement pit sequence It is characterized by having the disk judging section which discriminates that the existence and the displacement pattern of a displacement pit sequence are in agreement from the output from said displacement pit sequence detecting element and a displacement pattern coincidence detecting element.
[0016] Moreover, the optical disk which has said rocking truck and the rocking truck detecting element which extracts a rocking component from a tracking error signal, It is characterized by having the arrangement position information detecting element and rocking frequency information detecting element which read and memorize the arrangement position information and the rocking frequency information that a rocking truck exists, and the disk judging section which discriminates a disk from the output of said rocking truck detecting element.
[0017]
[Function] By the above-mentioned composition, this invention is forming peculiar truck form as a recognition signal for every optical disk, identifies whether the disk which it is going to play is an original disk, and can restrict use of the data based on an unjust copy disk.
[0018]
[Working example] The optical disk with an unjust copy prevention function of the 1st work example of this invention is explained hereafter, referring to Drawings.

[0019] The schematic diagram of the optical disk with an unjust copy prevention function in the 1st work example of this invention is shown in drawing 1 . In drawing 1 (a), 1 is a disk and is a disk identification region with [2 / the lead-in groove field of the disk] a displacement pit sequence in 3. Moreover, drawing 1 (b) is an enlarged drawing in a disk identification region, and a displacement pit sequence and 8 are optical spots the truck for which 4 was formed as a pit sequence a pit and 5, the main pit sequence for which the pit was formed 6 centering on the truck, and 7.
[0020] Operation is explained using drawing 1 . A truck 5 is formed as a series of pit sequences by a predetermined modulation rule of cutting (exposure) using laser in the master stamper manufacturing process for disk manufacture. During cutting of this truck 5, the displacement pit sequence 7 is formed by cutting in the state where the track radial direction was made to displace the laser beam for cutting temporarily in a predetermined position. The amount of displacement of the track radial direction of this displacement pit sequence 7 is the range which does not have big influence on the regenerative signal of the information expressed by Pitt, and gives the quantity which displacement of a pit sequence can detect as level variation of a tracking error signal.
[0021] Generally amplitude change deltaRF of the regenerative signal RF to amount of position shifts deltax of Pitt 4 and the optical spot 8 becomes like drawing 2 (a), and, on the other hand, amplitude change deltaTE of tracking error signal TE to amount of position shifts deltax of Pitt 4 and the optical spot 8 becomes like drawing 2 (b). Compared with amplitude change deltaTE of a tracking error signal, amplitude change deltaRF of a regenerative signal to amount of position shifts deltax Namely, since it is small, If it is in the state of the suitable amount of position shifts (Pitt's amount of displacement), amplitude change of a regenerative signal is the range which does not affect reproduction of information, and it is possible to detect the level variation of a tracking error signal certainly.
[0022] usually, the amount of displacement which can detect level variation if it takes into consideration that the precision required of tracking control is about [of a track pitch TP] 1/15 -- a track pitch -- what is necessary is just to set it as 1 / about 15 to 1/8 suitable quantity in general
[0023] Moreover, usually since a tracking error signal passes LPF (Low Pass Filter), in order to detect it as level variation of the signal after LPF passage It is necessary to make the length of the truck line direction of a displacement pit sequence into the length in the LPF signal band (about 50kHz or less) of a tracking error signal. therefore, the truck line direction length of the displacement pit sequence 7 -- as the pass time of the optical spot 8 -- tens -- what is necessary is just to make it become more than microsec
[0024] The wave of the regenerative signal RF in the above-mentioned displacement pit sequence 7 and tracking error signal TE is shown in drawing 3 . When the optical spot 8 is in the main pit sequence 9, since there is an optical spot 8 at the center of a truck 5 mostly by tracking control, tracking error signal TE shows about zero value. Moreover, the regenerative signal RF turns into a signal according to Pitt's 4 existence.
[0025] Next, when the optical spot 8 starts the displacement pit sequence 7 of amount of displacement deltax, since the optical spot 8 cannot follow the displaced pit sequence steeply, position shift deltax arises in the optical spot 8 and Pitt 4, and, only in delta TE, the level of tracking error signal TE changes suddenly. Moreover, the regenerative signal RF does not influence reproduction, although only delta RF is changed.

[0026] the pass time of the displacement pit sequence 7 -- tens -- in being about microsec, before the optical spot 8 follows the displacement pit sequence 7, in order to return to the usual main pit sequence 10, a tracking error signal returns to about zero again like drawing 3 . Therefore, tracking error signal TE before and behind the displacement pit sequence section 7 serves as a wave as shown in drawing 3 .
[0027] therefore -- if the displacement pit sequence is prepared in the original disk -- **** -- the level variation of a tracking error signal arises in the displacement pit sequence section like. On the other hand, when copying the information in an original disk to other archive media, it is possible to copy the information acquired from a regenerative signal, but since a displacement pit sequence is not copied, an original disk or a copy disk can be identified by the existence of a displacement pit sequence.
[0028] In addition, if the disk identification region 3 which arranges this displacement pit sequence is used together with the management data field (for example, TOC field of CD) of the disk certainly played at the time of a disk reproduction operation start and it enables it to certainly check it at the time of disk starting, it is efficient.
[0029] Next, the 2nd work example is explained. Drawing 4 is the schematic diagram of the displacement pit sequence in the 2nd work example, and shows the case where the displacement direction of a displacement pit sequence is combined by a regular pattern. In drawing 4 , the main pit sequence which consisted of Pitt to whom Pitt and 5 have 8 in a truck, it is in an optical spot, and 4 has 11, 12, and 13 centering on a truck, and 14 and 15 are the discernment Pitt sections which consisted of a displacement pit sequence and a displacement pit sequence of plurality [16]. Here, the case where it has arranged two displacement pit sequences 14 and 15 at a time to one disk perimeter and inner circumference side, respectively is described.
[0030] The arrangement area of the amount of displacement of each displacement pit sequences 14 and 15 and length, and a displacement pit sequence is the same as that of the 1st work example. [if the optical spot 8 shall pass displacement pit sequence ID114 by the side of the perimeter first and then shall pass displacement pit sequence ID215 by the side of inner circumference like drawing 4 , the level variation of a tracking error signal will arise in a displacement pit sequence as the 1st work example explained, but] Since the direction of this level variation changes with Pitt's displacement directions, it becomes tracking error signal TE changed to the negative side a right side like drawing 4 in the position of a displacement pit sequence, respectively.
[0031] Therefore, it becomes possible to identify the pattern of a displacement pit sequence according to the state of the level variation of a tracking error signal. It becomes possible to separate certainly the level variation of the tracking error signal generated with the crack of a disk, dirt, etc., and the level variation of the tracking error signal by a displacement pit sequence with constituting a pattern, using a displacement pit sequence two or more. 1 set of discernment Pitt sections 16 constituted combining such two or more displacement pit sequences can form arbitrary patterns by combining arbitrarily the displacement direction of each displacement pit sequence, and the number. For example, when using two displacement pit sequences ID1 and ID2 in a group, (ID1, ID2) can choose four displacement patterns, (inner circumference, inner circumference), (inner circumference and the perimeter), (the perimeter and inner circumference), and (the perimeter and the perimeter), in the combination of a displacement direction. In addition, the length of the main pit sequence 12 between the displacement pit sequence 14 and the

displacement pit sequence 15 may be shorter than the displacement pit sequences 14 and 15, and is also omissible.

[0032] Next, the 3rd work example is explained. Drawing 5 shows the arrangement information of the displacement pit sequence in the 3rd work example. The management data field for which a disk records 31, the lead-in groove field of the disk was recorded 32, and disk management data was recorded 33, and 34 are displacement Pitt arrangement trucks with which displacement Pitt has been stationed. As for the disk management data of the contents of the disk etc., and 37, 35 is [the arrangement position information on a displacement pit sequence and 39] the displacement pattern information of a displacement pit sequence displacement pit information and 38 the management data of a disk, and 36. Moreover, 40 is a truck and 41 is a displacement pit sequence or a discernment pit sequence.

[0033] Although this example explains the case where arrangement position information and displacement pattern information are recorded as displacement pit information When only arrangement position information or displacement pattern information is recorded, supposing only the information on an arrangement position or a displacement pattern is effective, it can realize without losing generality. What is necessary is just to record the information on the direction which is not specified to specification on the disk, when the arrangement position or the displacement pattern is especially decided as disk specification. Moreover, [since it is desirable to record on some data of the management data field which records the contents of the disk etc. as for this displacement pit information, explain as what displacement Pitt column information is recorded on the management data field 33 of the disk, but] It is satisfactory even if it arranges displacement Pitt column information in addition to a management data field.

[0034] First, in the usual management data field, wherever it may repeat and record the block of the management data of the same contents and an optical head may be in [in a management data field], management data can be read. The displacement pit information 37 other than the disk management data in which the contents and the position of a disk are shown is recorded on the management data 35. Moreover, the displacement pit information 37 consists of displacement pattern information 39 of a displacement pit sequence (a displacement pattern, the number, etc.), when it constitutes the discernment Pitt section, the arrangement position information 38 which shows the track position (or address number) where the displacement pit sequence is arranged, and.

[0035] And the discernment Pitt section 41 which consists of combination of the displacement pit sequence shown in a displacement pit sequence or the displacement pattern information 39 is formed in the truck 40 shown in arrangement position information.

[0036] In the displacement Pitt arrangement truck 34 shown by the arrangement position information on displacement pit information, the displacement pit sequence (discernment Pitt section) 41 is arranged to two or more places like drawing 5 (c). Although ****** [the number of the displacement pit sequences (discernment Pitt section) 41 / one], since the portion may read by a disk defect etc. and may become impossible, this is because it is better to have arranged two or more displacement pit sequences (discernment Pitt section) 41 on the same truck.

[0037] In addition, one truck is sufficient as it, and even if it crosses the displacement Pitt arrangement truck 34 to the range about a number truck, it is satisfactory on operation.

[0038] If it is made like [the 2nd work example], since it is not necessary to record a displacement pit sequence on a large field and and a disk producer can specify arbitrary displacement patterns as arbitrary positions compared with the 1st work example, it will become possible to give code nature to discernment of a disk.
[0039] Next, the 4th work example is explained. Drawing 6 is the block diagram of the disk with an unjust copy prevention function of the 4th work example. It is an entire disk figure, 51 is a disk, and drawing 6 (a) is the disk identification region which consisted of trucks of the pit sequence which rocked 52 in the lead-in groove field of the disk, was made to rock 53 on regular frequency, and was formed. Drawing 6 (b) is the enlarged drawing of the disk identification region 53, and is the rocking truck with which constitute 4 from Pitt, 8 consisted of optical spots, and 54 consisted of pit sequences.
[0040] Since the optical spot 8 cannot follow rocking of the rocking truck 54 if the rocking frequency fwb of the rocking truck 54 of drawing 6 (b) is set as frequency higher than the band (gain crossover frequency) of tracking control, the rocking amplitude A becomes the amount of position shifts. Therefore, the fluctuating signal of rocking frequency is ****(ed) by the tracking error signal.
[0041] What is necessary is for below the band of LPF of a tracking error signal detecting element to carry out a rocking component, and just to set it as the range of 1kHz - 20kHz about, in order to detect as a level variation of a tracking error signal. Moreover, the rocking amplitude A is set as 1 of a track pitch TP / about 15 to 1/8 suitable quantity, as the 1st work example described as amplitude of the grade which does not affect a regenerative signal.
[0042] The regenerative signal RF at this time and the situation of tracking error signal TE are shown in drawing 7 . The optical spot 8 follows near the amplitude center of the rocking truck 54, and rocking of the rocking truck 54 cannot be followed. Therefore, in tracking error signal TE, the signal level equivalent to the rocking amplitude A occurs on the rocking frequency fwb. Moreover, although amplitude fluctuation arises in the regenerative signal RF, it is the level which does not influence reproduction.
[0043] Discernment of an original disk or a copy disk can be performed by detecting the signal level of the specific frequency fwb of the tracking error signal produced with this rocking truck 54.
[0044] If this rocking truck is used together with the management data field (for example, TOC field of CD) of the disk certainly played at the time of a disk reproduction operation start like the 1st work example and it enables it to certainly check it at the time of disk starting, it is efficient.
[0045] Next, the 5th work example is explained. Drawing 8 shows the arrangement information of the rocking truck in the 5th work example. The management data field for which a disk records 61, the lead-in groove field of the disk was recorded 62, and disk management data was recorded 63, and 64 are trucks with which the rocking truck has been arranged. As for the disk management data of the contents of the disk etc., and 67, 65 is [the arrangement position information on a rocking truck and 69] the rocking frequency information on a rocking truck rocking track information and 68 the management data of a disk, and 66.
[0046] Although this example explains the case where arrangement position information and rocking frequency information are recorded as rocking track information When only arrangement position information or rocking frequency information is recorded,

supposing only the information on an arrangement position or rocking frequency is effective, it can realize without losing generality. What is necessary is just to memorize on the disk the information which is not specified to specification, when the arrangement position or the displacement pattern is especially decided as specification of a disk. Moreover, [since it is desirable to record on some data of the management data field which records the contents of the disk etc. as for this rocking track information, explain as what rocking track information is recorded on the management data field 63 of the disk, but] It is satisfactory even if it arranges rocking track information in addition to a management data field.

[0047] First, in the usual management data field, as mentioned above in the work example 4, the management data 65 is arranged repeatedly, and the rocking track information 67 other than the disk management data 66 is recorded in each management data 65. Moreover, the rocking track information 67 records the arrangement position information 68 and the rocking frequency information 69 that the rocking truck is arranged.

[0048] The track number (or address number) in which the rocking truck 64 exists is recorded on the arrangement position information 68 in the management data field 63. Moreover, the forming-rocking truck 64 rocking frequency fwb is recorded on the rocking frequency information 69.

[0049] The rocking truck 64 shown by the arrangement position information 68 on a rocking truck makes the pit sequence rock with the frequency and the predetermined amplitude which were shown using the rocking frequency information 69. Although one truck is sufficient as a rocking truck and it may be formed succeeding a multiple track, it is not necessary to make it a not much large field.

[0050] By making it the disk configuration shown in the 5th work example, since it is not necessary to establish a rocking truck in a large field and and a disk producer can specify a rocking truck as arbitrary positions on arbitrary frequency, it becomes possible to give code nature to disk discernment.

[0051] Next, the 6th work example is explained. Drawing 9 is the schematic diagram of the optical disk unit with an unjust copy disk identifying function of the 6th work example. As for the optical disk with an unjust copy prevention function which stated 1 in the 1st work example or the 4th work example, the truck with which Pitt on a disk 1 and 5 are constituted for 4 as a pit sequence, and 7, in drawing 9 , a displacement pit sequence and 8 are optical spots. Moreover, the optical head on which 70 is the disk motor made to rotate a disk 1, and 71 plays the Pitt signal on a disk 1 optically, The tracking error signal detecting element from which 72 detects tracking error signal TE equivalent to the amount of radial position shifts of the optical spot 8 and a truck 5, The differential circuit where 73 takes the differential of the regenerative signal from the optical head 71, the low pass filter in which 74 removes the high-frequency component of a tracking error signal, The phase compensation section in which 75 generates a head drive controlling signal from a tracking error signal, The head actuator in which 76 drives an optical head, the adder circuit where 77 generates a regenerative signal from an optical head, The binary-ized circuit section in which 78 performs synchronous detection of binary-izing of a regenerative signal, and data, the signal-processing section which 79 restores to a regenerative signal and reads information, The displacement pit sequence detecting element in which 80 detects the displacement pit sequence section from a

tracking error signal, and 81 and 82 are the voltage comparators which constitute the displacement pit sequence detecting element 80, and it is the disk judging section from which 98 performs an OR circuit and 92 discriminates a disk.

[0052] In the optical disk unit constituted as mentioned above, a method of operation is explained using drawing 9 and 10. In addition, the optical disk which has the displacement pit sequence of the 1st work example here is explained to an example.

[0053] Operation in which tracking control to which a disk 1 rotates and the optical spot 8 follows a truck 5 top here is performed is the same as that of the method described by conventional parallel. Moreover, process in which the course and tracking error signal which read information from a regenerative signal are generated is the same as that of conventional parallel.

[0054] Drawing 10 is the principle-of-operation figure of the displacement pit sequence detecting element 80 which detects the displacement pit sequence 7 from a tracking error signal.

[0055] When a displacement pit sequence is made to displace to the perimeter side to a track-center-line top and it is made to displace to the (a) and inner circumference side, it has (b). When the optical spot 8 passes the displacement pit sequence 7, since a position shift arises in the optical spot 8 and the displacement pit sequence 7 as the work example 1 already described, rapid level variation arises in a tracking error signal, and it becomes like drawing 10 . The direction of level variation of tracking error signal TE at this time changes with displacement directions of the displacement pit sequence 7. Here, in drawing 10 (a), it shall change to a right side, and shall change to a negative side by drawing 10 (b). So, in the displacement pit sequence detecting element 80, existence of the displacement pit sequence 7 is detectable by comparing the change level of this tracking error signal TE at the time of displacement pit sequence passage with the slice level set up beforehand. Here, in order to detect displacement of the direction of the perimeter and to detect displacement of slice level REF (+) and the direction of inner circumference, slice level REF (-) is set up, and level with tracking error signal TE is compared by the voltage comparators 81 and 82 in the displacement pit sequence detecting element 80. As a result, synchronizing with the direction displacement pit sequence 7 of the perimeter, DET (-) is detected synchronizing with the direction displacement pit sequence 7 of DET(+) inner circumference, and existence of a displacement pit sequence is detected. DET (+) and DET (-) are inputted into the disk judging section 92 as an IDDET signal which shows whether a displacement pit sequence exists by OR circuit 98.

[0056] In the disk judging section 92, when DET (+) and DET (-) are not detected (IDDET=L), it is recognized as a displacement pit sequence not existing, and it is judged that it is not an original disk here. On the other hand, when one of DET (+) and the DET(s) (-) is detected (IDDET=H), it is judged that it is an original disk.

[0057] In addition, although the displacement pit sequence detecting element 80 is the composition of detecting the level of tracking error signal TE, in drawing 9 and 10, it is also possible to detect the sudden level variation of tracking error signal TE by a differential circuit like drawing 11 . In drawing 11 , 95 is 96 and a differential circuit and 97 are voltage comparators. When tracking error signal TE lets the differential circuit 95 pass, a wave like a TED signal is obtained. This TED signal detects whether it exceeded with slice level REF2 (-) to the right side at the negative side to DET2 (+) and DET2 (-)

with slice level REF2 (+). That is, existence of the displacement pit sequence 7 is also discriminable by whether DET2 (+) or DET2 (-) are detected.

[0058] Since the level variation by rocking arises at a tracking error signal also in the case of the optical disk with which a disk has the rocking truck of the 4th work example, When this level variation exceeds slice level REF (+) and REF (-), DET (+) and DET (-) are outputted in the displacement pit sequence detecting element 80. Therefore, what is necessary is just to identify a disk by the existence of the output of DET (+) and DET (-) by the disk judging section 92.

[0059] Next, the 7th work example is explained. Drawing 12 is the block diagram of the optical disk unit with an unjust copy disk identifying function in the 7th work example. In drawing 12 , the optical disk with an unjust copy prevention function which stated 1 in the 2nd work example, and 4 are Pitt on a disk 1, and it is displacement pit sequence ID1 and displacement pit sequence ID2 which have been arranged by the truck with which 5 is constituted as a pit sequence, and 8 having 14, and an optical spot and 15 having a displacement pattern. Here explains taking the case of the case where the pattern of a displacement pit sequence is identified using two displacement pit sequences. 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, and 92 are the same as that of the 6th work example, and the pattern coincidence detecting element 83 which judges whether the pattern of a displacement pit sequence newly agrees with a fixed pattern was formed in the 7th work example.

[0060] In the optical disk unit constituted as mentioned above, a method of operation is explained using drawing 12 and 13.

[0061] Here, two displacement pit sequence ID114 and ID215 drawing 13 , respectively The perimeter side displacement pit sequence, In the bottom constituted as an inner circumference side displacement pit sequence, the case is shown, tracking error signal TE produces level variation in the portion of each displacement pit sequence as above-mentioned, in the displacement pit sequence detecting element 80, the TE level variation is detected and DET (+) and DET (-) are outputted. Since the identification condition of this disk is that DET (+) and DET (-) are detected by a fixed pattern, in this example, DET (+) will be detected first and then DET (-) should just be detected. So, in the pattern coincidence detecting element 83, when the output pattern of DET (+) and DET (-) decided beforehand and the pattern of DET (+) and DET (-) actually outputted from a displacement pit sequence detecting element are in agreement, the coincidence signal IDDET is outputted. Namely, what is necessary is just to judge that a disk is an original disk, when the coincidence signal IDDET is outputted. This judgment is made in the disk judging section 92.

[0062] Next, the 8th work example is explained. Drawing 14 is the schematic diagram of the optical disk unit with an unjust copy disk identifying function of the 8th work example. In drawing 14 , the optical disk with an unjust copy prevention function which stated 51 in the 4th work example, and 4 are Pitt on a disk 51, and the rocking truck with which 54 consisted of pit sequences which rocked with predetermined frequency and amplitude radially. Moreover, as for 85, the amplitude measurement section of a rocking truck and 87 are the magnitude-comparison sections of rocking amplitude a rocking truck detecting element and 86.

[0063] Here, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, and 92 carry out same operation with the same composition as a work example 6.

[0064] In the optical disk unit constituted as mentioned above, a method of operation is explained using drawing 14 , and 15 and 16.
[0065] Drawing 15 shows the principle of operation which detects the rocking truck 54 by the rocking truck detecting element 85. Rocking twists on a truck, by truck 55, the optical spot 8 is positioned on the center line of a truck, and the tracking error signal usually serves as a value of the zero neighborhood in general. When the optical spot 8 is on the rocking truck 54, the optical spot 8 cannot follow rocking of a truck as mentioned above, but tracking error signal TE like drawing 15 is detected. It inputs into the amplitude measurement section 86 with the frequency characteristic which passes only the specific frequency (rocking frequency) fwb for this tracking error signal TE alternatively like drawing 16 . As a result, the output signal Awb of the amplitude measurement section 86 usually has small amplitude in truck 55 field, and is outputted as amplitude fluctuation by rocking truck 54. And when an Awb signal compared and exceeds whether the predetermined slice level REFwb was exceeded in the magnitude-comparison section 87, it is made to output the detection signal IDDET. Therefore, when IDDET is detected, a rocking truck will exist, and it is judged that it is an original disk. This judgment is made in the disk judging section.
[0066] In addition, the rocking truck detecting element 85 can also realize composition like drawing 17 like drawing 14 besides the composition in the amplitude measurement section 86 and the magnitude-comparison section 87. In drawing 17 , the frequency characteristic measurement section in which 88 measures frequency spectrum, and 89 are the amplitude analysis sections which detect whether it is no with the frequency component exceeding reference level.
[0067] The situation of operation of this rocking truck detecting element 90 is shown in drawing 18 . The frequency characteristic measurement section 88 sets up the suitable measurement section, and measures the frequency spectrum of tracking error signal TE in this section. In drawing 18 , the case of the measurement section 56 in a truck 55 and the measurement section 57 in the rocking truck 54 is usually illustrated. the measurement sections 56 and 57 -- the signal component in each frequency is measured by each, and frequency spectrum becomes as it is shown in a figure. Next, the amplitude analysis section 89 investigates how [that is the fixed rocking amplitude frequency fwb] the frequency is, when it investigates whether the frequency component which exceeds reference amplitude REFwb2 among the amplitude of each called-for frequency component exists and there is amplitude to exceed. As a result, when frequency is fwb, it judges with there being a rocking truck, and it outputs as detection signal IDDET=H (measurement section 57:00). However, when all the frequency components are smaller than reference amplitude REFwb2, or when the frequency of the frequency component exceeding REFwb2 is not in agreement with the rocking frequency fwb, it outputs as detection signal IDDET=L and it is shown that a rocking truck does not exist (measurement section 58:00).
[0068] The existence of a rocking truck can be judged by the output of the detection signal IDDET by the above.
[0069] Next, the 9th work example is explained. Drawing 19 is the schematic diagram of the optical disk unit with an unjust copy disk identifying function of the 9th work example. In drawing 19 , 31 is the described optical disk in the 3rd work example, and is the disk with which the displacement pit sequence 41 was formed in the position which

the arrangement position information 38 on the disk management data 36 and a displacement pit sequence was recorded on the management data field 33, was in it, and was specified by the arrangement position information 36.
[0070] 91 is the position information detecting element which reads arrangement position information, and 92 is the disk judging section. Moreover, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, and 80 carry out same operation with the same composition as the 6th work example.
[0071] Operation is hereafter explained using drawing 19 and 20. Drawing 20 is a flow chart which shows operation of the 9th work example. First, the management data field 31 of a disk is played at the time of playback of a disk 31 (s1). The disk management data 36 in which the contents and the position of the information currently recorded on the disk 31 are shown is recorded on this management data field 31, and this management data is usually played at the time of a playback start. It is assumed that the arrangement position information 37 which shows the address position by which the displacement pit sequence has been arranged combines, and is recorded on the disk 31 in which the displacement pit sequence of this invention was formed by a part of this management data field 31. Then, the position information detecting element 91 reads and memorizes the data (IDADR) about the displacement pit sequence arrangement position information 37 out of the data reproduced (s2).
[0072] Next, the optical head 71 is moved to the address which IDADR shows (s3). It is investigated whether the displacement pit sequence 41 exists in this address position (s4). Since the detection signal IDDET from the displacement pit sequence detecting element 80 is H when a displacement pit sequence exists, it is judged that it is an original disk at the time of IDDET=H (s5). On the other hand, if IDDET continues being L, it will be judged that the disk which it is going to play since it means that a displacement pit sequence does not exist is not an original disk (s6). The judgment of this disk is performed in the disk judging section 92.
[0073] In addition, although the 9th work example described the disk 31 with the displacement pit sequence 41, also in the disk 61 in which a rocking truck like the 5th work example was formed in the specified position, a disk can be judged by same operation. In this case, in the position information detecting element 91, while playing the management data field 63 in a disk 61, the arrangement position information 68 by which the rocking truck has been arranged is read.
[0074] Moreover, what is necessary is just to judge whether it is an original disk by whether the rocking truck detecting element 85 (or 90) described in the 8th work example instead of the displacement pit sequence detecting element 88 is formed, and IDDET is set to H in the specified address position.
[0075] Next, the 10th work example is explained. Drawing 21 is the schematic diagram of the optical disk unit with an unjust copy disk identifying function of the 10th work example. In drawing 21 , 31 is the described optical disk in the 3rd work example, and the displacement pattern information 39 of the disk management data 36 and a displacement pit sequence is recorded on the management data field 33, and it is in it. It is the disk with which the displacement pit sequence was formed in the decided track position 34 by the pattern shown by displacement pattern information.
[0076] 93 is the displacement pattern information detecting element which reads displacement pattern information, and 83 is the same as that of the pattern coincidence

detecting element of a work example 7. Moreover, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, and 92 carry out same operation with the same composition as the 6th work example.
[0077] Operation is hereafter explained using drawing 21 and 22. Drawing 22 is the operation flow chart of the 10th work example. Operation is explained using drawing 21 and 22.
[0078] First, the management data field 33 is reproduced at the time of a disk reproduction start (s11). At this time, the displacement pattern information (IDPAT) 39 of the displacement pit sequence currently recorded on the part in the management data field 33 is read and memorized by the displacement pattern information detecting element 93 (s12). This displacement pattern information (IDPAT) 39 is set up as a reference pattern which the pattern coincidence detecting element 83 compares (s13). Next, it is investigated whether a displacement pit sequence exists in the track position 34 considered that a displacement pit sequence probably exists (s14). Since the output IDDET of the pattern coincidence detecting element 83 will be set to H if it exists by the pattern by which the displacement pit sequence was decided, it is judged that it is an original disk (s15). Moreover, if IDDET continues being L, it will mean that the specified displacement pit sequence does not exist, and it will be judged that it is not an original disk (s16). The disk judging section 92 makes this judgment.
[0079] In addition, you may use simultaneously the arrangement position information on the displacement pit sequence of the 9th work example, and the displacement pattern information of the 10th work example for a judgment. Namely, what is necessary is just to investigate whether the displacement pit sequence which displacement pattern information shows exists in the position which the arrangement position information on a displacement pit sequence shows.
[0080] Next, the 11th work example is explained. Drawing 23 is the schematic diagram of the optical disk unit with an unjust copy disk identifying function of the 11th work example. In drawing 23 , 61 is the optical disk described in the 5th work example, and is the disk with which the rocking truck 64 was formed on the rocking frequency which the rocking frequency information 69 on the disk management data 66 and a rocking truck was recorded on the management data field 63, was in it, and was specified as rocking frequency information.
[0081] 94 is the rocking frequency information detecting element which reads rocking frequency information, 85 is the rocking truck detecting element described in the 8th work example, and 92 is the disk judging section.
[0082] Moreover, 70, 71, 72, 73, 74, 75, 76, 77, 78, and 79 carry out same operation with the same composition as the 6th work example.
[0083] Operation is explained using drawing 23 and 24. Drawing 24 is the operation flow chart of the 11th work example. First, the management data field 63 is reproduced at the time of a disk reproduction start (s21). At this time, the rocking frequency information (IDFWB) 69 currently recorded on the part in the management data field 63 is read and memorized by the rocking frequency information detecting element 94 (s22). This rocking frequency information (IDFWB) 69 is set up as reference frequency which the rocking truck detecting element 85 compares (s23). next, it is investigated whether a rocking truck exists in the track position where a rocking truck exists and which is considered to come out (s24). Since the output IDDET of the rocking truck detecting element 85 will be set to H if the rocking truck 64 formed on the specified rocking

frequency (IDFWB) exists, it is judged that it is an original disk (s25). Moreover, if IDDET continues being L, it will mean that the specified rocking truck does not exist and it will be judged that it is not an original disk (s26). The disk judging section 92 makes this judgment.

[0084] In addition, in using the amplitude measurement section 86 for drawing 16 as composition of the rocking truck detecting element 85, the passing frequency fwb uses a variable thing. Moreover, what is necessary is just to compare the frequency specified by IDFWB in the amplitude analysis section 89, in using the frequency characteristic measurement section 88 of drawing 17 .

[0085] In addition, you may use simultaneously the arrangement position information on the rocking truck of the 9th work example, and the rocking frequency information on the 11th work example for a judgment. Namely, what is necessary is just to investigate whether the truck of the rocking frequency which rocking frequency information shows exists in the position which the arrangement position information on a rocking truck shows.

[0086]

[Effect of the Invention] The displacement pit sequence which made the radial direction displace only the quantity with little influence to regenerative-signal reading this invention is detectable on some trucks which consist of pit sequences in the signal band of a tracking error signal from a track center line is prepared in some disks as mentioned above. It enables it to identify existence of a displacement pit sequence on the change level of the tracking error signal in that displacement pit sequence section, and discernment from the original disk which has this displacement pit sequence, and the copy disk which does not have a displacement pit sequence is enabled. Moreover, code nature can be further raised by recording the arrangement position information and displacement pattern information of the displacement pit sequence on some data as identification information peculiar to a disk, and identifying the existence of the displacement pit sequence of the specific pattern in the specified position of a displacement pit sequence.

[0087] Moreover, the rocking truck which is the specific frequency which cannot follow the truck which consists of pit sequences by tracking control, and made only amplitude with little influence to regenerative-signal reading rock radially is established in some disks. By judging the existence of a rocking truck with the signal level of the specific rocking frequency component in a tracking error signal, discernment from the original disk which has this rocking truck, and the copy disk which does not have a rocking truck is enabled. Moreover, the arrangement position information and the frequency information on a rocking truck are recorded on some data as identification information peculiar to a disk, a disk can be identified by investigating the signal level of the specific rocking frequency component in a specified position, and code nature can be raised more.

[Brief Description of the Drawings]

[Drawing 1] (a) is the figure showing the whole optical disk of the 1st work example. (b) is the figure which expanded the disk identification region.

[Drawing 2] The figure showing the relation between the amount of position shifts, a regenerative signal, and a tracking error signal

[Drawing 3] The figure showing the response waveform in the displacement pit sequence section
[Drawing 4] The figure showing the displacement pit sequence of the 2nd work example
[Drawing 5] (a) is the figure showing the whole optical disk of the 3rd work example.
(b) is the figure showing a management data field.
(c) is the figure showing a displacement Pitt arrangement truck.
[Drawing 6] (a) is the figure showing the whole optical disk of the 4th work example.
(b) is the figure which expanded the disk identification region.
[Drawing 7] The wave form chart of the regenerative signal in a rocking truck, and a tracking error signal
[Drawing 8] (a) is the figure showing the whole optical disk of the 5th work example.
(b) is the figure showing a management data field.
(c) is the figure showing a rocking truck.
[Drawing 9] The block diagram of the optical disk unit of the 6th work example
[Drawing 10] The figure showing the principle-of-operation figure of a displacement pit sequence detecting element
[Drawing 11] (a) is the figure showing the detector by a differential circuit.
(b) is the figure showing the detection principle by a differential circuit.
[Drawing 12] The block diagram of the optical disk unit of the 7th work example
[Drawing 13] The figure showing the detection principle by the 7th work example
[Drawing 14] The block diagram of the optical disk unit of the 8th work example
[Drawing 15] The figure showing the principle of operation of a rocking truck detecting element
[Drawing 16] The figure showing the frequency characteristic of the amplitude measurement section
[Drawing 17] The block diagram of the example 2 of realization of a rocking truck detecting element
[Drawing 18] The figure showing the principle of operation in the example 2 of realization
[Drawing 19] The block diagram of the optical disk unit of the 9th work example
[Drawing 20] The flow chart of the 9th work example
[Drawing 21] The block diagram of the optical disk unit of the 10th work example
[Drawing 22] The flow chart of the 10th work example
[Drawing 23] The block diagram of the optical disk unit of the 11th work example
[Drawing 24] The flow chart of the 11th work example
[Drawing 25] The block diagram showing the tracking control block of conventional parallel
[Explanations of letters or numerals]
1 Disk
2 Lead-in Groove Field
3 Disk Identification Region
4 Pit Sequence
5 Truck
6 Main Pit Sequence
7 Displacement Pit Sequence
8 Optical Spot

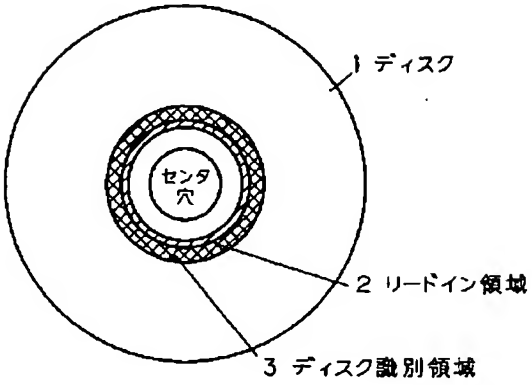
9, 10, 11, 12, 13 Main pit sequence
14 Displacement Pit Sequence ID1
15 Displacement Pit Sequence ID2
16 Discernment Pitt Section
31 Disk
32 Lead-in Groove Field
33 Management Data Field
34 Displacement Pitt Arrangement Truck
35 Management Data
36 Disk Management Data
37 Displacement Pit Information
38 Arrangement Position Information
39 Displacement Pattern Information
40 Truck
41 Displacement Pit Sequence or Discernment Pitt Section
42 Pitt
51 Disk
52 Lead-in Groove Field
53 Disk Identification Region
54 Rocking Truck
55 Usually, Truck
56, 67 Measurement section
61 Disk
62 Lead-in Groove Field
63 Management Data Field
64 Rocking Truck
65 Management Data
66 Disk Management Data
67 Rocking Track Information
68 Arrangement Position Information
69 Rocking Frequency Information
70 Disk Motor
71 Optical Head
72 Tracking Error Signal Detecting Element
73 Differential Circuit
74 Low Pass Filter
75 Phase Compensation Section
76 Head Actuator
77 Adder Circuit
78 Binary-ized Circuit Section
79 Signal-Processing Section
80 Displacement Pit Sequence Detecting Element
81, 82 Voltage comparator
83 Pattern Coincidence Detecting Element
85 Rocking Truck Detecting Element
86 Amplitude Measurement Section

87 Magnitude-Comparison Section
88 Frequency Characteristic Measurement Section
89 Amplitude Analysis Section
90 Rocking Truck Detecting Element
91 Position Information Detecting Element
92 Disk Judging Section
93 Displacement Pattern Information Detecting Element
94 Rocking Frequency Information Detecting Element
95 Differential Circuit
96, 97 Voltage comparator
98 OR Circuit
200 Disk
201 Truck
202 Optical Spot
210 Disk Motor
211 Optical Head
212 Semiconductor Laser
213 Collimate Lens
214 Objective Lens
215 Half Mirror
216a, 216b Light sensing portion
217 Actuator
220 Tracking Error Signal Detecting Element
221 Differential Circuit
222 Low Pass Filter
223 Phase Compensation Section
224 Head Actuator
225 Adder Circuit
226 Binary-ized Circuit Section
227 Signal-Processing Section

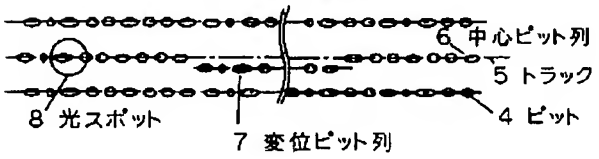
[Drawing 1]

第1実施例の光ディスク

(a) ディスク全体図

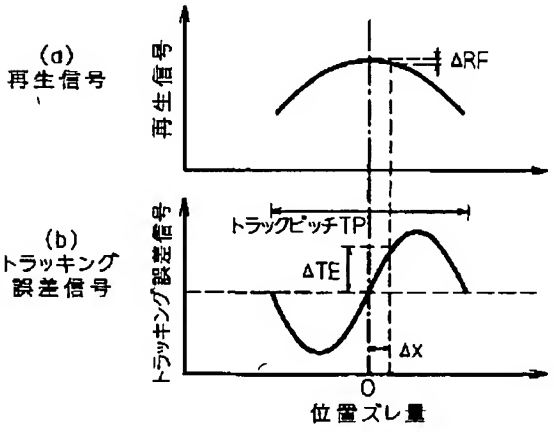


(b) ディスク識別領域拡大図



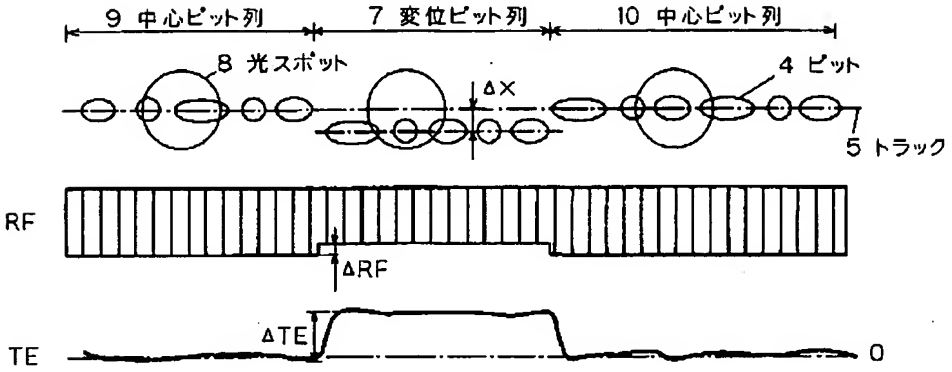
[Drawing 2]

位置ズレ量と再生信号、トラッキング誤差信号



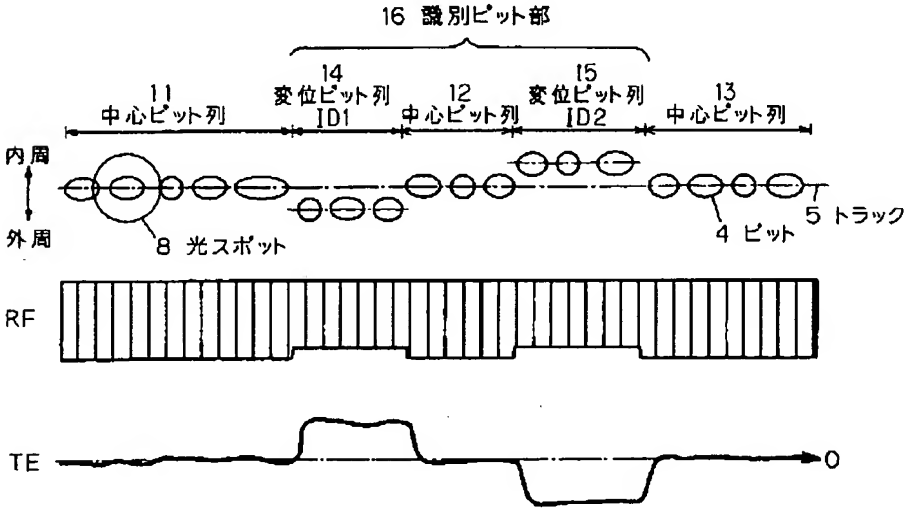
[Drawing 3]

変位ピット列部分での応答波形



[Drawing 4]

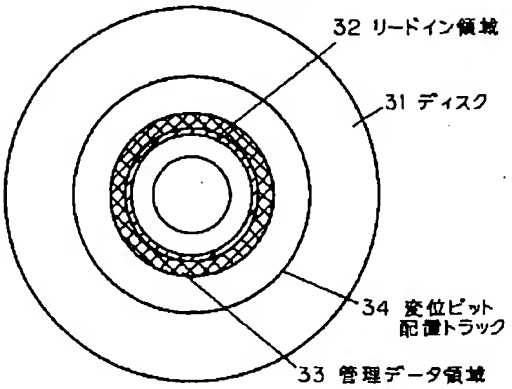
第2実施例の変位ピット列



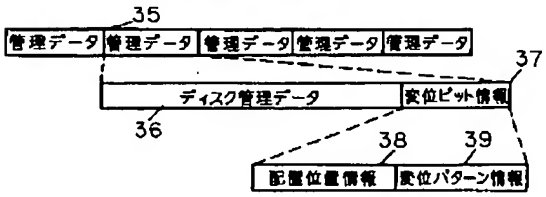
[Drawing 5]

第3実施例の光ディスク

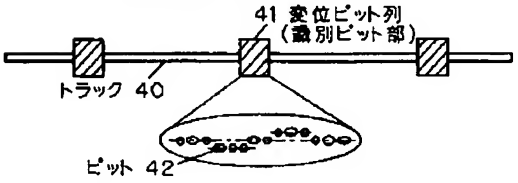
(a) ディスク全体図



(b) 管理データ領域



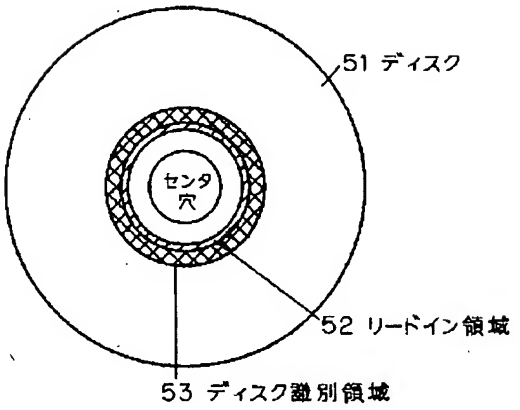
(c) 変位ピット配置トラック



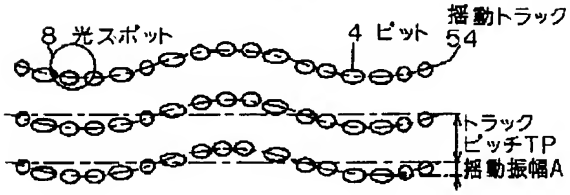
[Drawing 6]

第４実施例の光ディスク

(a) ディスク全体図

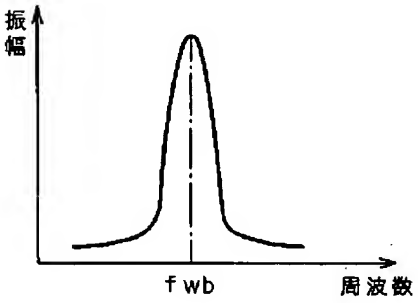


(b) ディスク識別領域拡大図



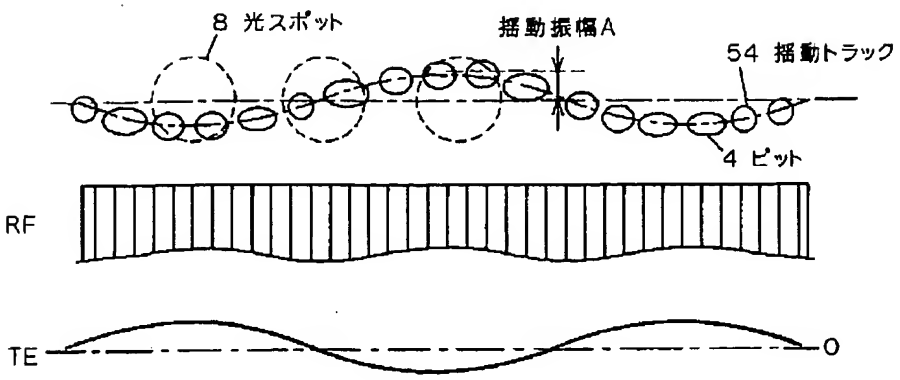
[Drawing 16]

振幅測定部の周波数特性



[Drawing 7]

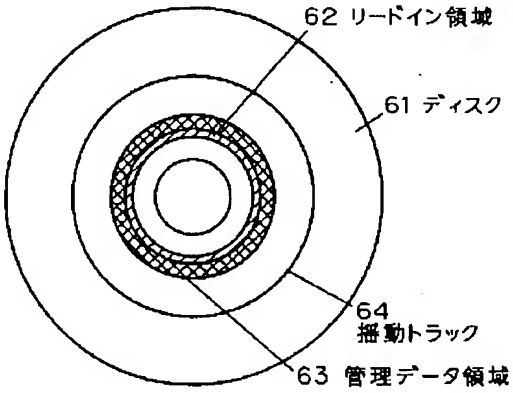
摇動トラックと再生信号、トラッキング誤差信号



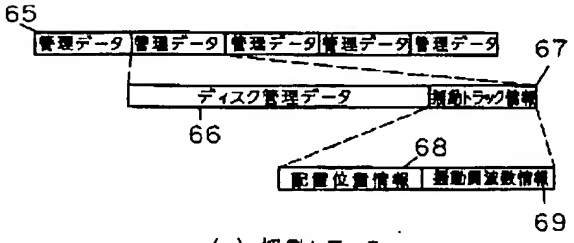
[Drawing 8]

第5実施例の光ディスク

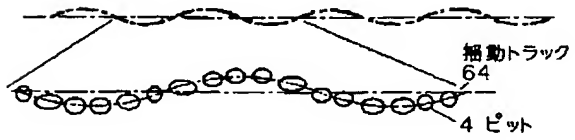
(a) ディスク全体図



(b) 管理データ領域



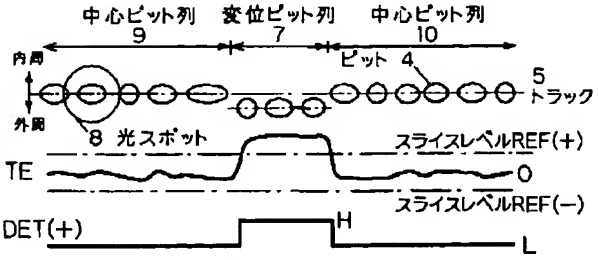
(c) 摇動トラック



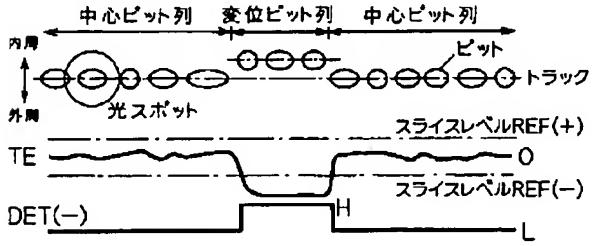
[Drawing 10]

変位ピット列検出部の動作原理図

(a) 外周側変位ピット列

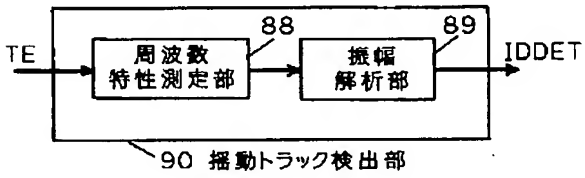


(b) 内周側変位ピット列



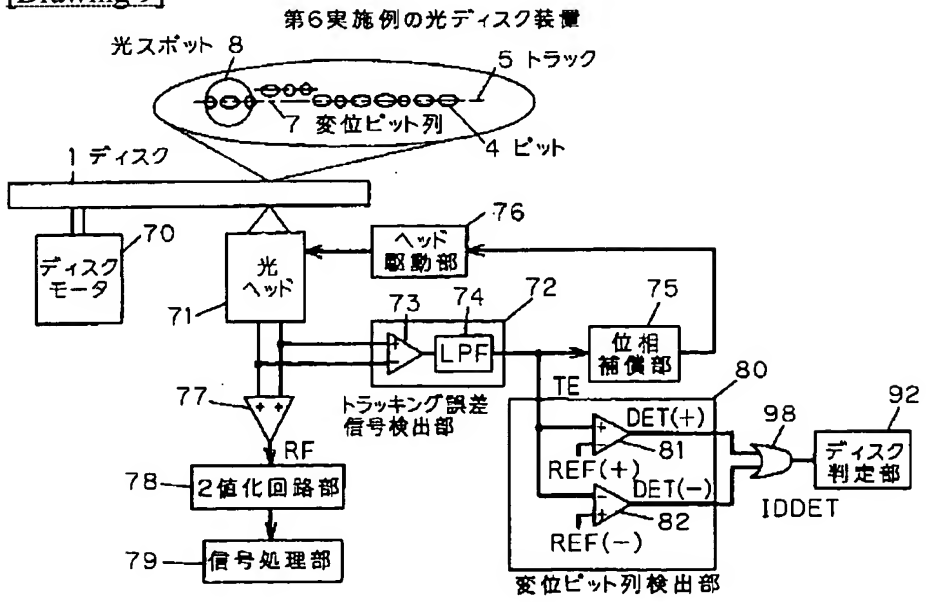
[Drawing 17]

揺動トラック検出部の実現例2



[Drawing 9]

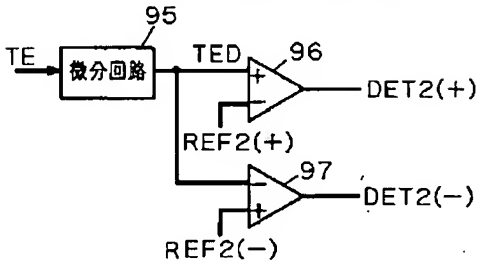
第6実施例の光ディスク装置



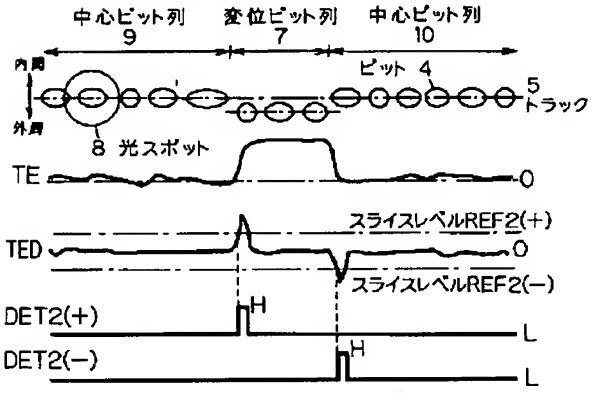
[Drawing 11]

変位ピット列検出部の原理(2)

(a) 微分回路による検出回路

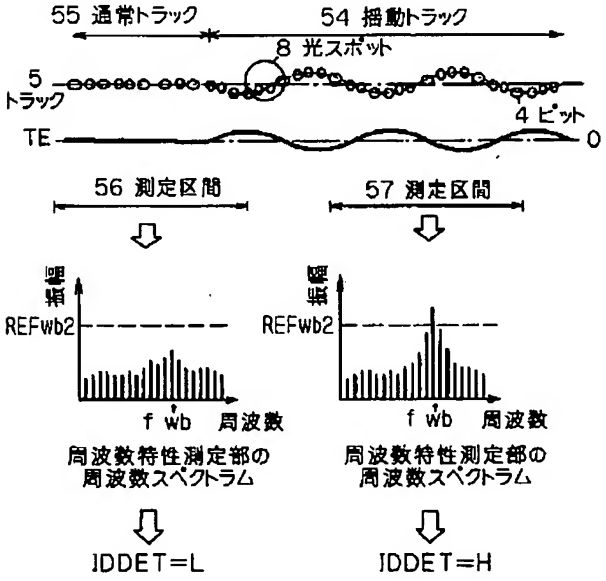


(b) 微分回路による検出原理



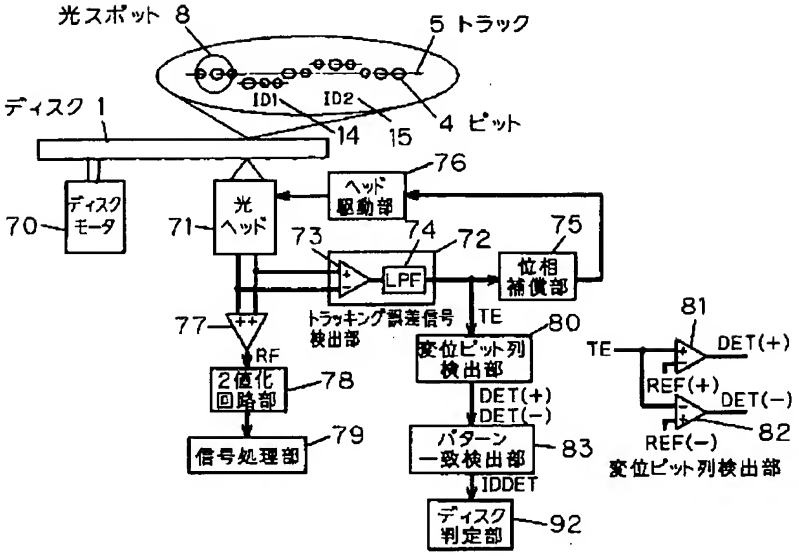
[Drawing 18]

実現例2での動作原理



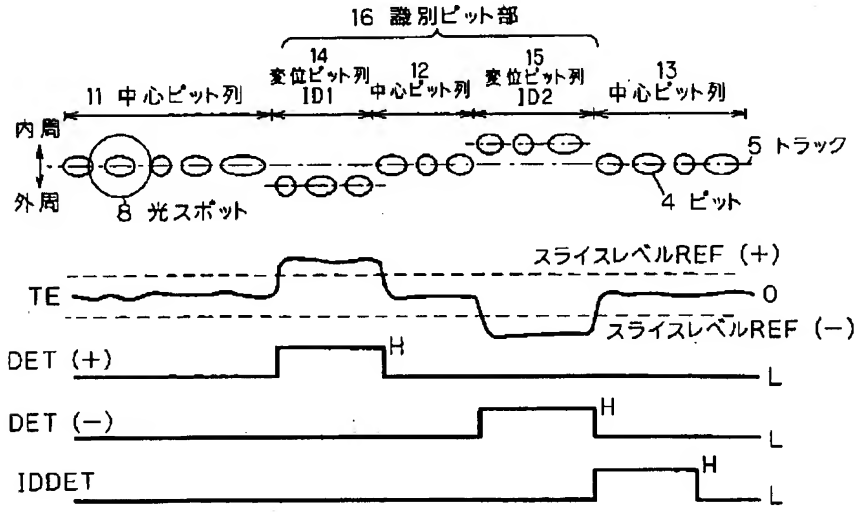
[Drawing 12]

第7実施例の光ディスク装置



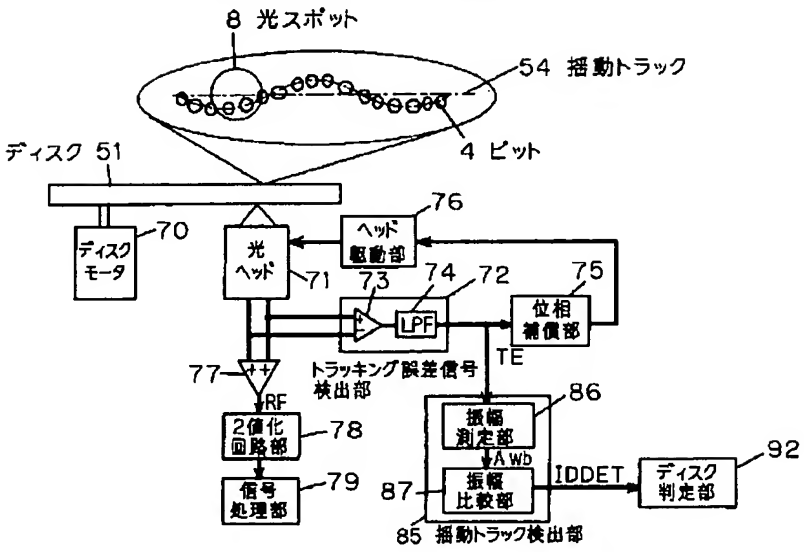
[Drawing 13]

第7実施例における検出原理



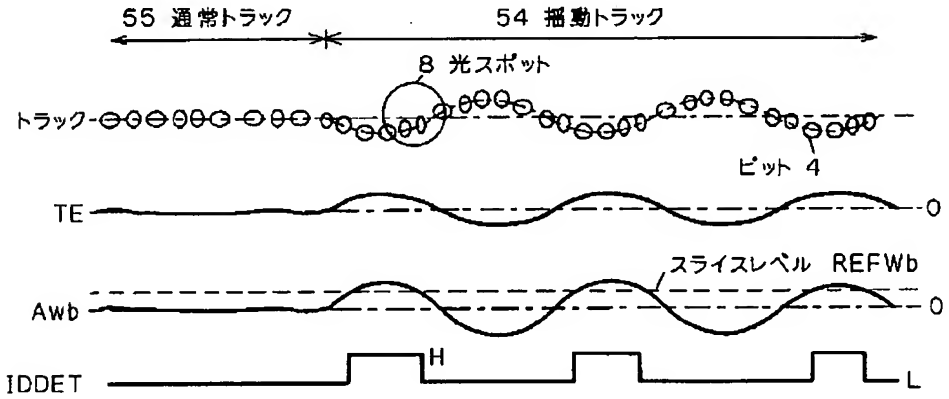
[Drawing 14]

第8実施例の光ディスク装置



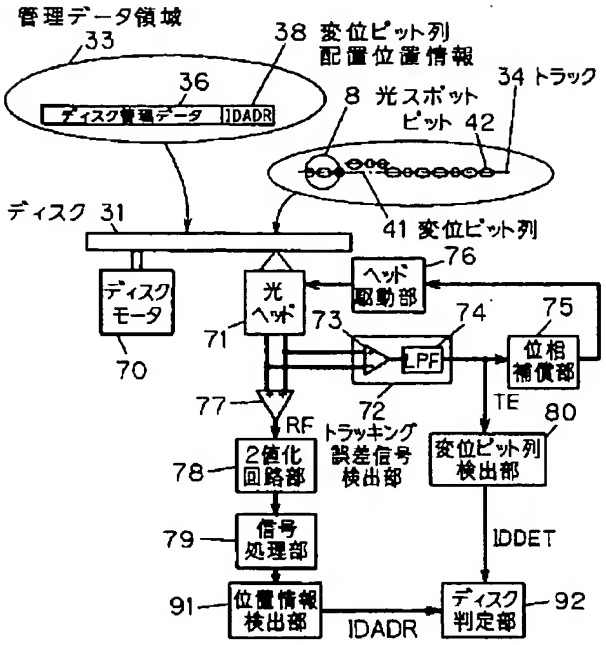
[Drawing 15]

揺動トラック検出部の動作原理



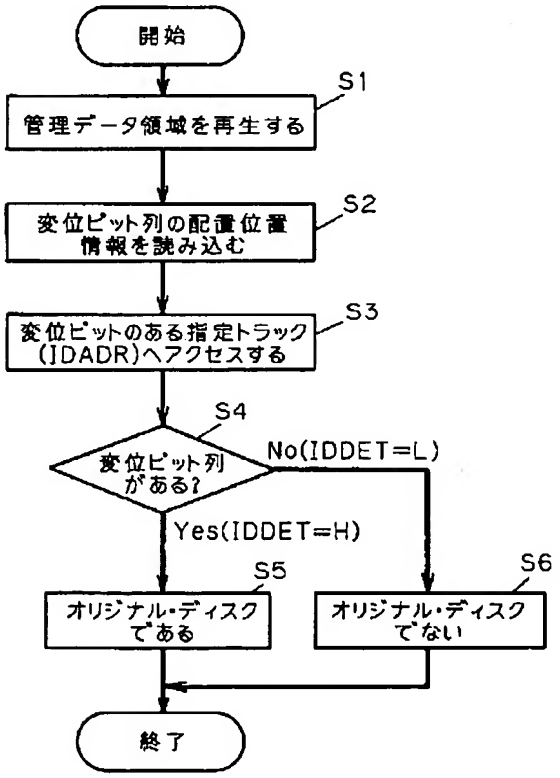
[Drawing 19]

第9実施例の光ディスク装置



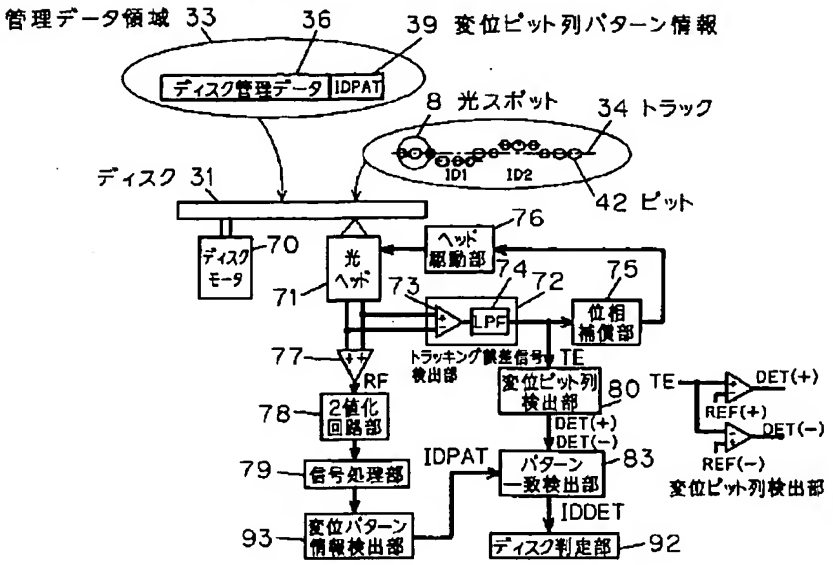
[Drawing 20]

第9実施例のフローチャート



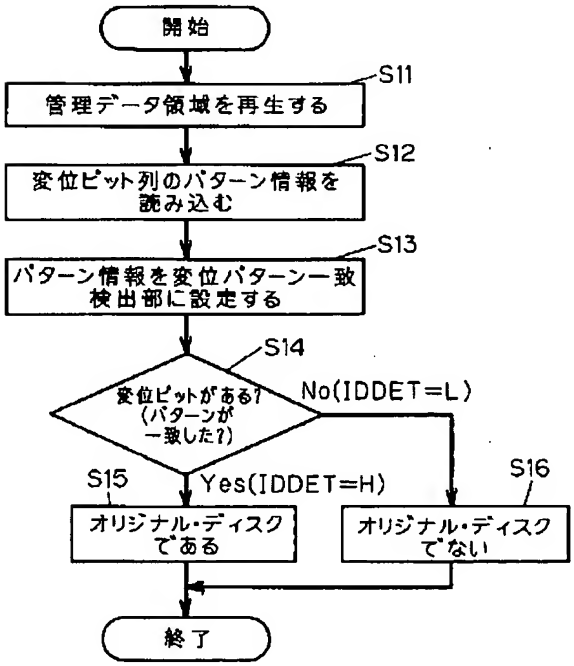
[Drawing 21]

第10実施例の光ディスク装置



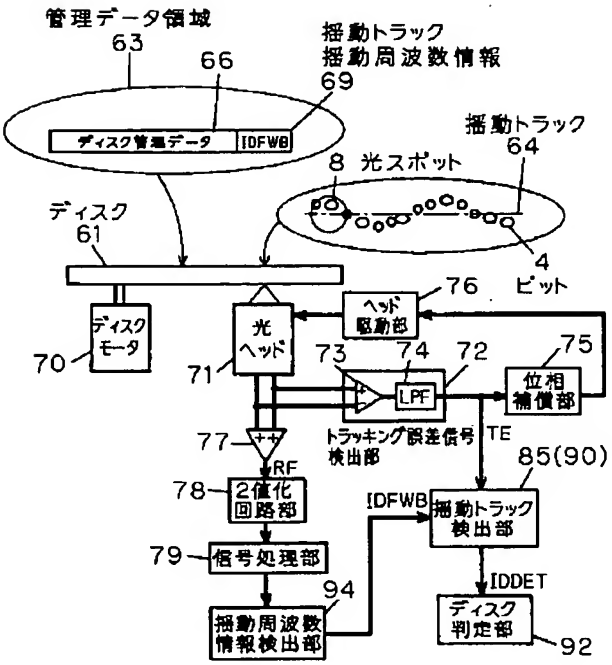
[Drawing 22]

第10実施例のフローチャート



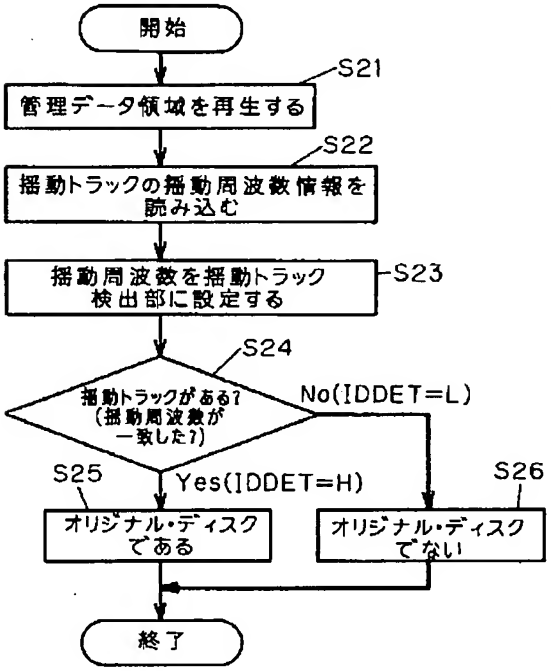
[Drawing 23]

第11実施例の光ディスク装置



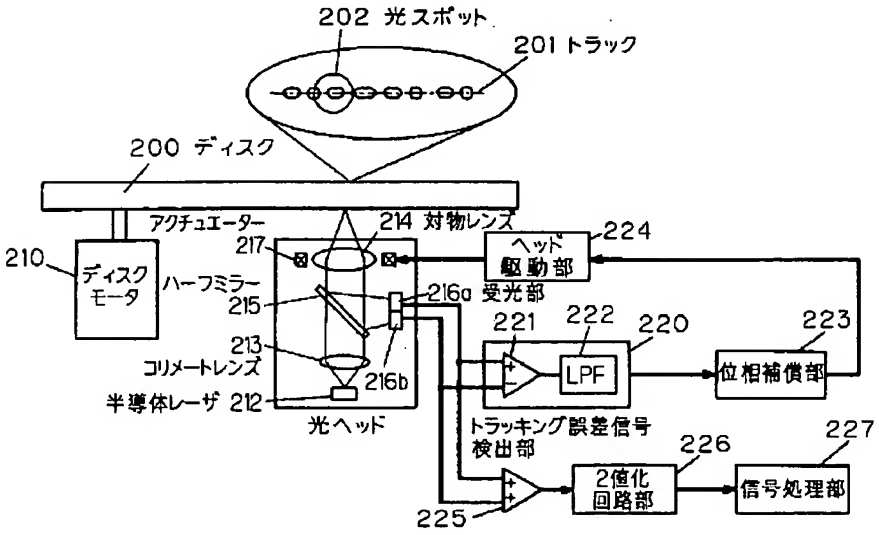
[Drawing 24]

第11実施例のフローチャート



[Drawing 25]

従来例のトラッキング制御ブロック



[Translation done.]